

# Environmental Protection Agency

## **Sample Analysis Correlation Procedure**

This procedure is written for the Environmental Protection Agency, National Vehicle and Fuel Emissions Laboratory (NVFEL) internal use. The use of specific brand names by NVFEL in this procedure are for reference only and are not an endorsement of those products. This document may be used for guidance by other laboratories.

### **NVFEL Reference Number**

013A

### **Implementation Approval**

Original Procedure Authorized by EPCN #235 on 04-23-2001

### **Revision Description**

- (1) 09-18-2001 The purpose of this change is to update the Group Responsible name per EPCN #316

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## 1. Purpose

The purpose of this working procedure is to describe the equipment required to perform and document the Sample Analysis Correlation (SAC) process in the PNGV engine test cells.

## 2. Test Procedure

101 The following equipment is required:

a quad blend compressed gas cylinder containing HC, NOX, CO<sub>2</sub>, CO, and balance nitrogen,

evacuated and leak-checked sample bag,

SAC spreadsheet hardcopy (see Figure 2).

102 Fill the sample bag from the quad-blend gas cylinder, estimating the amount needed for the SAC process. See Figure 1. There should be enough gas in the bag to analyze on each site plus the rerun of the first site. The gas analysis must be completed within 10 minutes of the bag-fill.



Figure 1  
Fill Sample Bag

103 Check the pressure gauge on the quad-blend gas cylinder. If the bottle pressure falls below 300 psi, replace the cylinder.

104 On the "SACspreadsheet.xls" (Figure 2), record the following:

"Start Time." See Arrow 1 in Figure 2.

"Technician ID." See Arrow 2 in Figure 2.

"Date." See Arrow 3 in Figure 2.

"Blended Bottle Press." See Arrow 4 in Figure 2.

SACspreadsheet.xls

Blended Bottle Conc.	Range	HC	Range	Nox	Range	CO	Range	CO2
		97.31		89.84		90.23		0.81%
		ppm		ppm		ppm		
Bench 1 (room 516)	500	500		1000		16%		
Bench 2 (room 516)	500	500		1000		16%		
PreCat (room 510)								
Line 9/10	500	500		500		2.5%		
Line 11/12	500	500		500		2.5%		
A202 (room 503)	16	17		16		22		
HFID (room 503)								
Heated Nox (room 503)								
Cell 3 & 4 (room 419A)								
Line 1 Nox		17						
Line 2 HFID	16							
Line 3 CO/CO2				16		22		
Bag re-check with first analyzer run								
Start Time:	1							
End Time:								
Technician ID:	2							
Date:	3							
Blended Bottle Press.	4							
Notes/Comments:								

Figure 2  
SACspreadsheet.xls Form

105 In the test site control room, turn on the Horiba analyzer bench, if necessary.

- 106 On the Horiba computer screen, select "Ope." See the arrow in Figure 3.



Figure 3  
Select OPe

- 107 From the selections that appear on the Horiba computer screen, select the appropriate test cell, either "9/10" or "11/12." See the arrow in Figure 4.

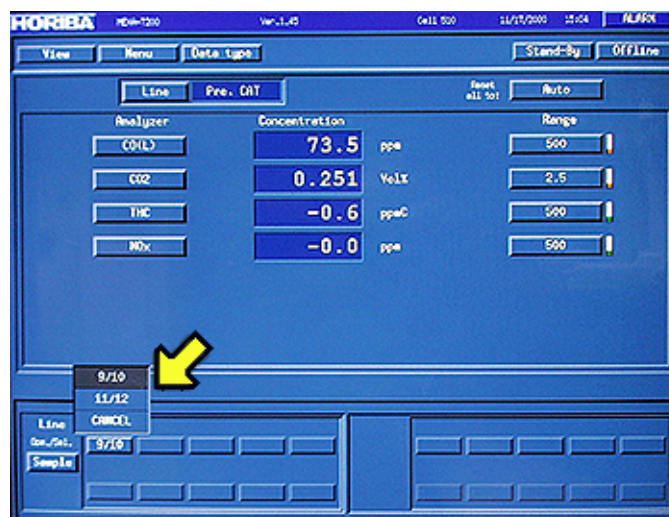


Figure 4  
Select Test Cell

- 108 On the Horiba computer screen, select "Sample" See the arrow in Figure 5.

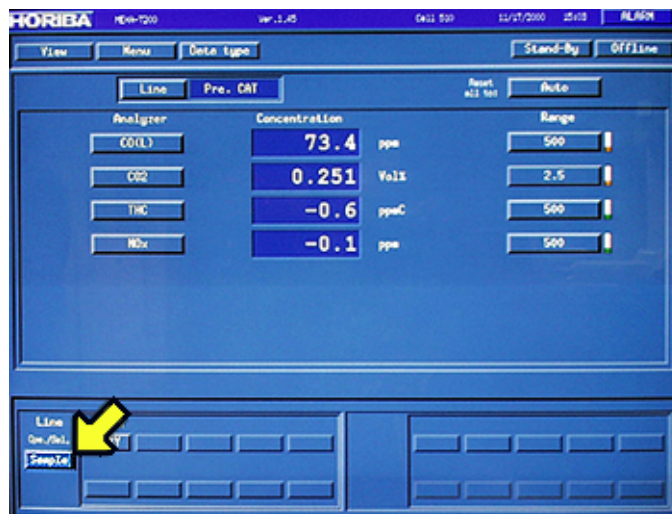


Figure 5  
Select Sample

- 109 From the selections that appear, select "Cal." See the arrow in Figure 6.

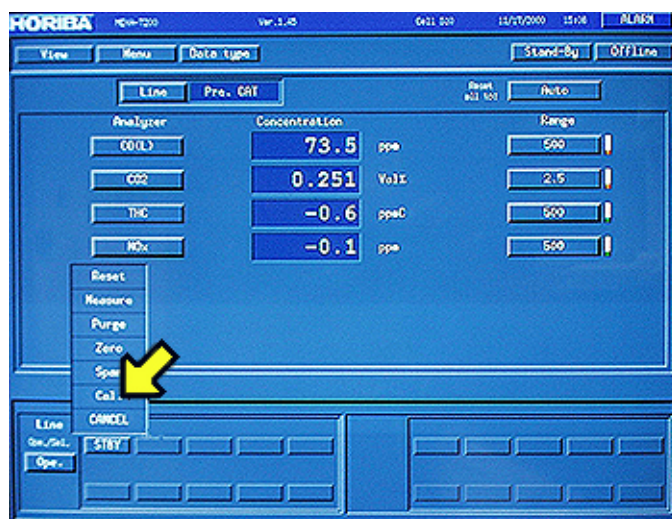


Figure 6  
Select Cal



- 110 A zero, span, and zero calibration will be automatically performed on the analyzers. See Figure 7.

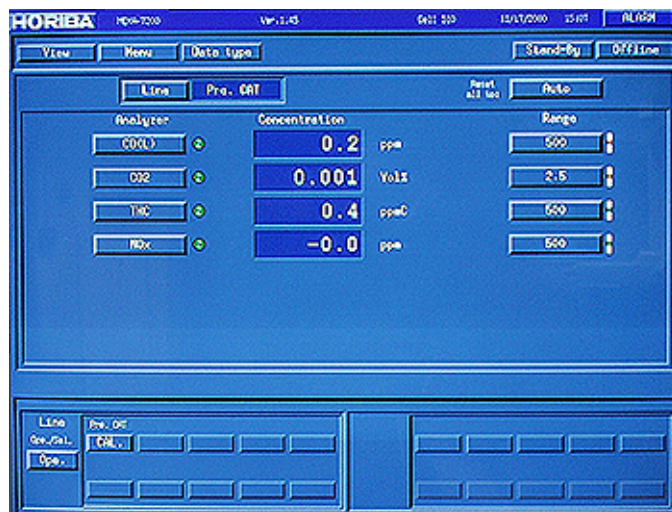


Figure 7  
Zero, Span Check

- 111 When the calibration is complete, select "Sample" See the arrow in Figure 8.

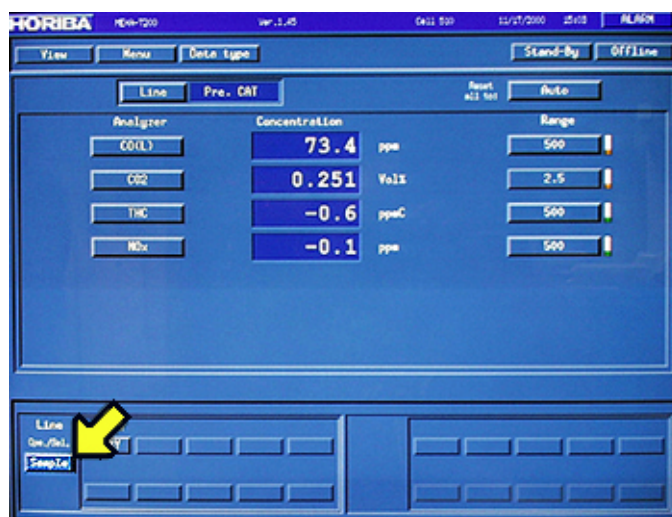


Figure 8  
Select Sample

- 112 From the selections that appear, select "Measure" See the arrow in Figure 9.

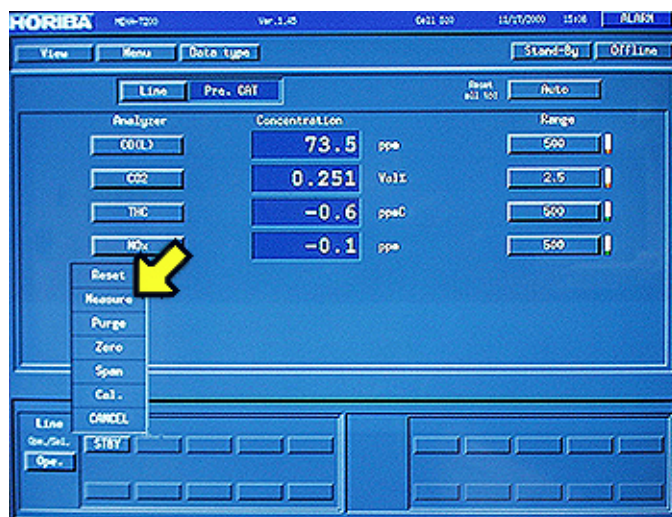


Figure 9  
Select Measure

- 113 Enter the test cell and connect the sample bag to the SAC quick-disconnect for the bench selected for this process. See Figure 10.

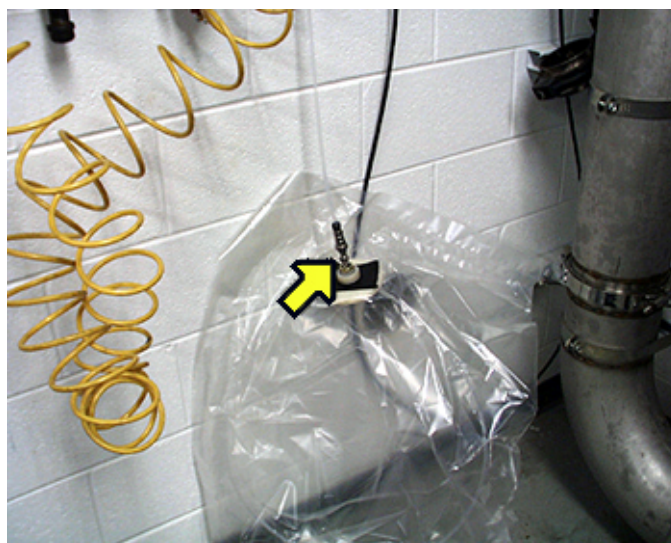


Figure 10  
SAC quick-disconnect and Sample Bag



- 114 Return to the control room Horiba computer and on the "SACspreadsheet.xls Form" record the following data listed under "Concentration:" that appears on the screen.

CO, See arrow number 1 in Figure 11.

CO<sub>2</sub>, See arrow number 2 in Figure 11.

HC, See arrow number 3 in Figure 11.

NO<sub>x</sub>, See arrow number 4 in Figure 11.

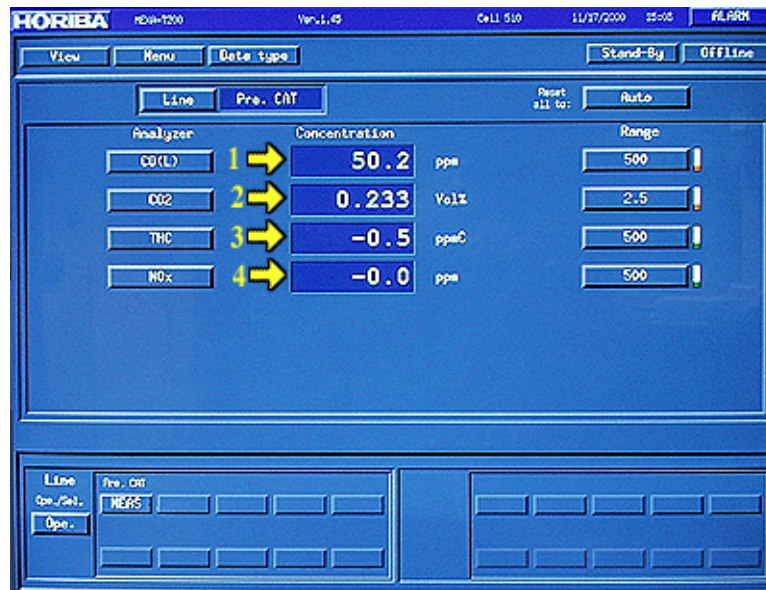


Figure 11  
Concentration

- 115 Go to the control room Data Processing Computer and sign on by entering the user name and password.

- 116 On the Data Processing Computer desktop, select the "My Computer" icon. See the arrow in Figure 12.

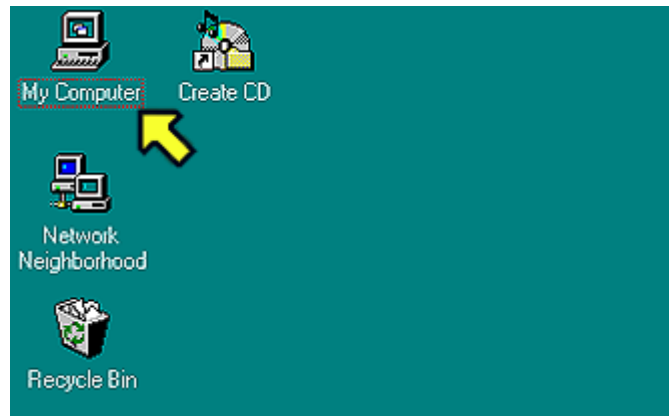


Figure 12  
Select My Computer

- 117 On the "My Computer" screen, select the "Micron (C)" drive icon. See the arrow in Figure 13.

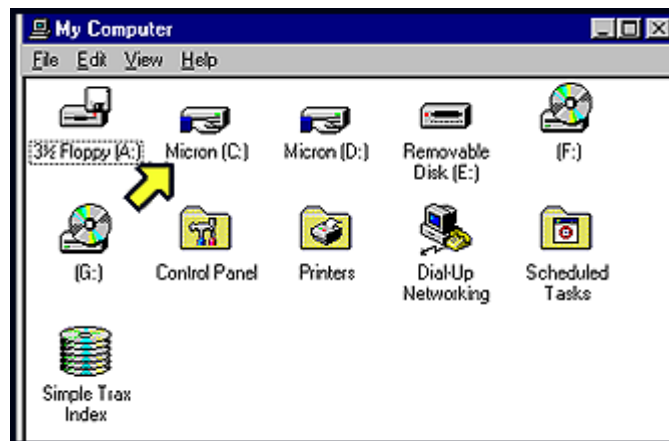


Figure 13  
Select Micron(C)

- 118 From the "Micron (C)" screen, select the "Calibrations" icon. See the arrow in Figure 14.

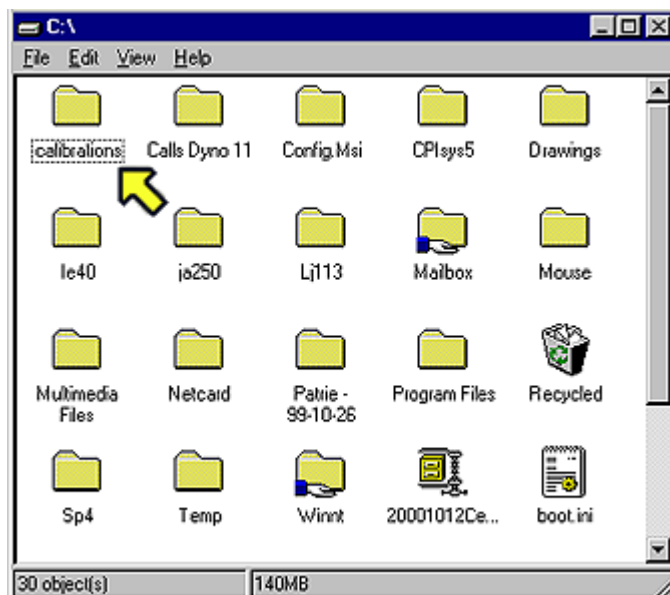


Figure 14  
Select Calibrations

- 119 From the "Calibrations" screen, select the "SacTemplat" icon. See the arrow in Figure 15.

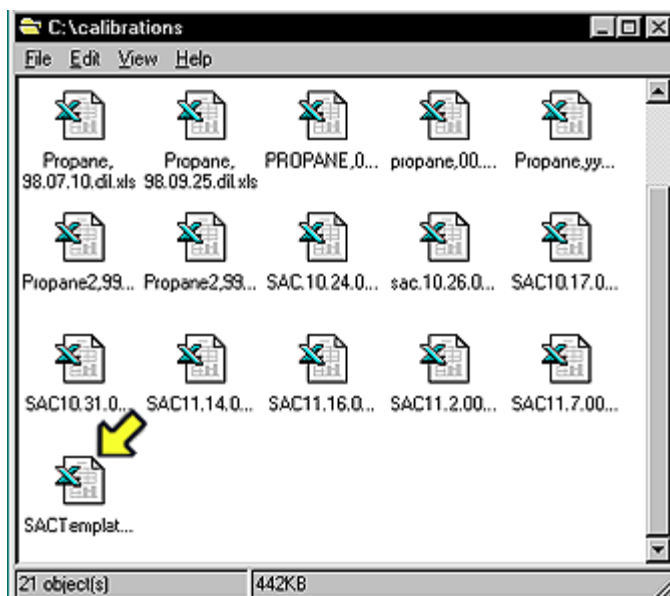


Figure 15  
Select SACTemplat...

- 120 On the spreadsheet screen shown in Figure 16, access the appropriate yellow-shaded fields, and use the keyboard to enter the following data recorded in Step 114:

For HC, enter the data in the row for the bench under test in the "HC" column. See arrow number 1.

For NOX, enter the data in the row for the bench under test in the "NOX" column. See arrow number 2.

For CO, enter the data in the row for the bench under test in the "CO" column. See arrow number 3.

For CO2, enter the data in the row for the bench under test in the "CO2" column. See arrow number 4.

1 2 3 4

SAC.XX.XX.XX.xls

Order	Blended Bottle Conc.	HC	% Diff	Nox	% Diff	CO	% Diff	CO2	% Diff
Run		99.09		90.81		89.53		0.81	
		ppm		ppm		ppm		%	
	Bench 1 (room 516)	289	3.22	88.7	-2.32		-100.00	0.81	0.00
	Bench 2 (room 516)	279.2	-0.08	90.5	-0.34	89	-0.59	0.81	0.00
	PreCat (room 510)								
	Line 9/10		-94.00		-100.00		-100.00		-100.00
	Line 11/12	276.4	-1.02	89.5	-1.44	89.4	-0.15	0.813	0.37
	A202 (room 503)	96.8	-2.31	89.78	-1.13	90.3	0.86	0.8	-1.23
	HFID (room 503)		-100.00						
	Heated Nox (room 503)				-100.00				
	Cell 3 & 4 (room 419A)								
	Line 1 Nox			0.2	-0.67				
	Line 2 HFID	95.2	2.07						
	Line 3 CO/CO2					90.2	0.75	0.813	0.37
	Bag re-check with								
	first analyzer run	92.1	-7.05	89.4	-1.55	89.4	-0.15	0.815	0.62
	Start Time:	6:00							
	End Time:	6:20							
	Technician ID:	17278							
	Date:	4/5/01							
	Blended Bottle Press.	1750							
	Notes/Comments:	Recalibrated Bench 1/Passed THC-Still high after curves run with Secondaries							

Figure 16  
SAC Spreadsheet

- 121 After all data has been entered, verify that the calculated value in the "%Diff" field does not exceed:

±3.3% for HC

±4.5% for NOX

±2.1% for CO<sub>2</sub>

±2.1% for CO.

If the value in the "%Diff" field exceeds the values listed, go to step 111 and repeat the procedure.

If, after a second attempt, the value in the "%Diff" field exceeds the values listed, perform first-line diagnostics to determine if a filter is clogged or other problem exists.

- 122 On the spreadsheet screen shown in Figure 17, enter the SAC end time. See the arrow in Figure 17:

	<b>Start Time:</b>		
	<b>End Time:</b>		
	<b>Technician ID:</b>		
	<b>Date:</b>		
	<b>Blended Bottle Press.</b>		
	<b>Notes/Comments:</b>		

Figure 17  
SAC End Time

- 123 Enter all of the required data. If diagnostics are unsuccessful, enter the reason for the failure in the cell next to the "Notes/Comments" cell and notify a senior PNGV technician.
- 124 Save the spreadsheet as "SAC.XX.XX.xls", where XX.XX equals Month.Year.



- 125      Print 2 copies of the "SAC.XX.XX.xls" spreadsheet. File in the following locations:
- SAC Ring Folder
- File in Room 516
- 126      Exit the spreadsheet program.
- 127      Go into the test cell and disconnect the sample bag.
- 128      Evacuate and leak-check the sample bag.

### 3.    Acceptance Criteria

- 3.1      The calculated values in the "%Diff" field must not exceed:
- $\pm 3.3\%$  for HC
- $\pm 4.5\%$  for NOX
- $\pm 2.1\%$  for CO<sub>2</sub>
- $\pm 2.1\%$  for CO.